Appendix F

Glossary

Definitions of words used in this guidance document are listed here; the underlined words are defined elsewhere in this glossary.

AEROBIC
Living or active in the presence of oxygen. Used in this report to refer especially to microorganisms and/or decomposition of organic matter.

ANAEROBIC
Living or active in the absence of oxygen, e.g., anaerobic microorganisms.

ANIMAL (AND POULTRY) MANURE
Animal excreta, including bedding, feed and other by-products of animal feeding and housing operations.

BACTERIA
Single-celled microscopic organisms lacking chlorophyll. Some cause disease, and some do not. Some are involved in performing a variety of beneficial biological treatment processes including biological oxidation, solids digestion, nitrification, and denitrification.

BIOLOGICAL OXIDATION
The aerobic degradation of organic substances by microorganisms, ultimately resulting in the production of carbon dioxide, water, microbial cells, and intermediate byproducts.

BIOSOLIDS
The organic solids product of municipal wastewater treatment that can be beneficially utilized. Wastewater treatment solids that have received PSRP or PFRP treatment, or their equivalents, according to the Part 503 rule to acheive a Class A or Class B pathogen status.

The solids:liquid content of the product can vary:

- liquid biosolids 1-4% solids
- thickened liquid biosolids 4-12% solids
- dewatered biosolids 12-45% solids
- dried biosolids >50% solids (advanced alkaline stabilized, compost, thermally dried)

In general liquid biosolids and thickened liquids can be handled with a pump. Dewatered/dried biosolids are handled with a loader.

BOD (BIOCHEMICAL OXYGEN DEMAND)

The quantity of oxygen used in the biological and chemical oxidation (decomposition) of organic matter in a specified time, at a specified temperature (typically 5 days at 20^{o}C), and under specified conditions. A standardized BOD test used in assessing the amount of organic matter in wastewater.

BUFFER

Around the perimeter of a storage or application area, a strip of land that is not intended to receive biosolids. The purpose of the buffer is to provide a protected zone around field boundaries, roads and sensitive areas, such as streams and wet soil areas.

BY-PRODUCT

A secondary or additional product; something produced in the course of treating or manufacturing the principal product.

CAKE

Dewatered biosolids with a solids concentration high enough (>12%) to permit handling as a solid material. (Note: some dewatering agents might still cause slumping even with solids contents higher than 12%).

CATION EXCHANGE CAPACITY (CEC)

A measure of the soil's capacity to attract and retain plant nutrients that occur in positively charged ionic form. CEC is a focus of interest because fertilizers supply positively charged cationic plant nutrients, which are attracted to negatively charged anionic soil particles, including soil organic matter. Organically amended soils typically have a higher CEC, i.e., a higher capacity for attracting and retaining plant nutrients, than unamended or low organic soils.

CFU (COLONY FORMING UNITS)

A term used to enumerate microbes in a sample and based on the fact that the visible cluster (colony) of microbes that appears on nutrient agar medium in a petri dish can develop from a single or group of microbial cells.

COMPOSTING

The accelerated decomposition of organic matter by microorganisms, which is accompanied by temperature increases above ambient; for biosolids, composting is typically a managed aerobic process.

CONSOLIDATED (BIOSOLIDS)

A desirable characteristic of biosolids that allows the material to be stacked and remain non-flowing when stored.

CRITICAL CONTROL POINT

A location, event or process point at which specific monitoring and responsive management practices should be applied.

DENITRIFICATION

The conversion of nitrogen compounds to nitrogen gas or nitrous oxide by microorganisms in the absence of oxygen.

DEWATERED BIOSOLIDS

The solid residue (12% total solids by weight or greater) remaining after removal of water from a liquid biosolids by draining, pressing, filtering or centrifuging. Dewatering is distinguished from thickening in that dewatered biosolids may be transported by solids handling procedures.

DIGESTION

Decomposition of organic matter by microorganisms with consequent volume reduction. Anaerobic digestion produces methane and carbon dioxide, whereas aerobic digestion produces carbon dioxide and water.

EQ BIOSOLIDS

Exceptional Quality biosolids, meets Class A pathogen reduction, and Vector Attraction Reduction standards 1- 8, and Part 503, Table 3 high quality pollutant concentration standards.

EUTROPHICATION

A natural or artificial process of nutrient enrichment by which a water body becomes highly turbid, depleted in oxygen, and overgrown with undesirable algal blooms.

FECAL COLIFORM

The type of coliform bacteria present in virtually all fecal material produced by mammals. Since the fecal coliforms may not be pathogens, they indicate the potential presence of human disease organisms. See indicator organisms.

FECAL STREPTOCOCCUS

A member of a group of gram-positive bacteria known as *Enterococci*, previously classified as a subgroup of *Streptococcus.* They are found in feces of humans, animals, and insects on plants often not in association with fecal contamination. See indicator organisms.

FIELD STORAGE

Temporary or seasonal storage area, usually located at the application site, which holds biosolids destined for use on designated fields. State regulations may or may not make distinctions between staging, stockpiling, or field storage. In addition, the time limits for the same material to be stored continuously on site before it must be land applied range from 24 hours to two years.

FILTER PRESS

Equipment used near the end of the solids production process at a wastewater treatment facility to remove liquid from biosolids and produce a semi-solid cake.

GENERATOR

Person or organization producing or preparing the biosolids by treatment of wastewater solids. Also, a person or organization who changes the biosolids characteristics either through treatment, mixing or any other process.

GOOD MANAGEMENT PRACTICES

Schedules of activities, operation and maintenance procedures (including practices to control odor, site runoff, spillage, leaks, or drainage), prohibitions, and other management practices found to be highly effective and practicable in the safe, community-friendly use of biosolids and in preventing or reducing discharge of pollutants to waters of the United States.

HELMINTH AND HELMINTH OVA

Parasitic worms, e.g., roundworms, tapeworms, *Ascaris, Necator, Taenia*, and *Trichuris*, and ova (eggs) of these worms. Helminth ova are quite resistant to chlorination, and can be passed out in the feces of infected humans and organisms and ingested with food or water. One helminth ovum is capable of hatching and growing when ingested.

HYDRAULIC LOADING RATES

Amount of water or liquid biosolids applied to a given treatment process and expressed as volume per unit time, or volume per unit time per surface area.

INDICATOR ORGANISMS

Microorganisms, such as fecal coliforms and fecal streptococci (enterococci), used as surrogates for bacterial pathogens when testing biosolids, manure, compost, leachate and water samples. Tests for the presence of the surrogates are used because they are relatively easy, rapid, and inexpensive compared to those required for pathogens, such as salmonella bacteria.

INFILTRATION

The rate at which water enters the soil surface, expressed in inches per hour, influenced by both permeability and moisture content of the soil.

LAGOON

A reservoir or pond built to contain water, sediment and/or manure usually containing 4% to 12% solids until they can be removed for application to land.

LAND APPLICATION

The spreading or spraying of biosolids onto the surface of land, the direct injection of biosolids below the soil surface, or the incorporation into the surface layer of soil; also applies to manure and other organic residuals.

LEACHATE

Liquid which has come into contact with or percolated through materials being stockpiled or stored; contains dissolved or suspended particles and nutrients.

LIQUID BIOSOLIDS OR MANURE

Biosolids or animal manure containing sufficient water (ordinarily more than 88 percent) to permit flow by gravity or pumping.

MERCAPTANS

A group of volatile chemical compounds, that are one of the breakdown products of sulfur-containing proteins. Noted for their disagreeable odor.

MICROORGANISM

Bacteria, fungi (molds, yeasts), protozoans, helminths, and viruses. The terms *microbe* and *microbial* are also used to refer to microorganisms, some of which cause disease, and others are beneficial. Parasite and parasitic refer to infectious protozoans and helminths. Microorganisms are ubiquitous, possess extremely high growth rates, and have the ability to degrade all naturally occurring organic compounds, including those in water and wastewater. They use organic matter for food.

MINERALIZATION

The process by which elements combined in organic form in living or dead organisms are eventually reconverted into inorganic forms to be made available for a new cycle of growth. The mineralization of organic compounds occurs through oxidation and metabolism by living microorganisms.

MITIGATION

The act or state of reducing the severity, intensity, or harshness of something; to alleviate; to diminish; to lessen; as, to mitigate heat, cold, or odor.

MPN (MOST PROBABLE NUMBER)

A statistically approximation of the number of microorganisms per unit volume or mass of sample. Often used to report the number of coliforms per 100 ml wastewater or water, but applicable to other microbial groups as well.

NITRIFICATION

The biochemical oxidation of ammonia nitrogen to nitrate nitrogen, which is readily used by plants and microorganisms as a nutrient.

NONPOINT SOURCE

Any source, other than a point source, discharging pollutants into air or water.

NONPOINT SOURCE POLLUTION

Man-made or man-induced alteration of the chemical, physical, biological, or radiological integrity of water or air, originating from any source other than a point source.

NUTRIENT

Any substance that is assimilated by organisms and promotes growth; generally applied to nitrogen and phosphorus in wastewater, but also other essential trace elements or organic compounds that microorganisms, plants, or animals use for their growth.

NUTRIENT MANAGEMENT PLAN

A series of good management practices aimed at reducing agricultural nonpoint source pollution by balancing nutrient inputs with crop nutrient requirements. A plan includes soil testing, analysis of organic nutrient sources such as biosolids, compost, or animal manure, utilization of organic sources based on their nutrient content, estimation of realistic yield goals, nutrient recommendations based on soil test levels and yield goals, and optimal timing and method of nutrient applications.

ODOR CHARACTER

The sensory quality of an odorant, defined by one or more descriptors, such as fecal (like manure), sweet, fishy, hay, woody resinous, musty, earthy, see Atlas of Odor Character Profiles, 1985.

ODOR DILUTIONS TO THRESHOLD or D/T

Dimensionless unit expressing the strength of an odor. An odor requiring 500 binary (2-fold) dilutions to reach the detection threshold has a D/T of 500. An odor with a D/T of 500 would be stronger than an odor with a D/T of 20.

ODOR INTENSITY

A measure of the perceived strength of an odor. This is determined by comparing the odorous sample with "standard" odors comprised of various concentrations of n-butanol in odor-free air.

ODOR PERVASIVENESS

Persistence of an odor; how noticeable an odorant is as it's concentration changes; determined by serially diluting the odor and measuring intensity at each dilution.

ODOR THRESHOLD

Detection - The minimum concentration of an odorant that, on average can be detected in odor-free air.

Recognition - The minimum concentration of an odorant that, on average, a person can distinguish by its definite character in a diluted sample.

OFF-SITE STORAGE

Storage of biosolids at locations away from the wastewater treatment plant or from the point of generation. Several terms encompass various types of storage: Staging, Stockpiling, Field Storage, and Storage facility.

OVERLAND FLOW

Refers to the free movement of water over the ground surface.

PATHOGEN

Disease-causing organism, including certain bacteria, fungi, helminths, protozoans, or viruses.

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PERMEABILITY

The rate of liquid movement through a unit cross section of saturated soil in unit time; commonly expressed in inches per hour.

PFRP , PSRP

See Process to Further Reduce Pathogens, or Process to Significantly Reduce Pathogens

pH

A measure used to indicate the degree of acidity or alkalinity of a substance. The pH is expressed as the $\log_{10}$ of the reciprocal of the actual hydrogen ion concentration. The pH ranges from 0-14, where 0 is the most acidic , 14 is the most alkaline, and 7 is neutral.

PHYTOTOXIN

Any substance having a toxic or poisonous effect on plant growth. Immature or anaerobic compost can contain volatile fatty acids that are phytotoxic to plants. Soluble salts can also be phytotoxic in addition to toxic heavy metals and toxic organic compounds.

POINT SOURCE

Any discernable, confined, or discrete conveyance from which pollutants are or may be discharged, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, stack, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft.

POLYMER

A compound composed of repeating subunits used to aid in flocculating suspended particulates in wastewater into large clusters. This flocculation aids solids removal, and enhances the removal of water from biosolids during dewatering processes.

PROCESS TO FURTHER REDUCE PATHOGENS (PFRP)

The process management protocol prescribed in U.S. EPA Part 503 used to achieve Class A biosolids in which pathogens are reduced to undetectable levels. Composting, advanced alkaline stabilization, chemical fixation, drying or heat treatment, are some of the processes that can be used to meet Part 503 requirements for Class A.

PROCESS TO SIGNIFICANTLY REDUCE PATHOGENS (PSRP)

The process management protocol prescribed in U.S. EPA Part 502 used to achieve Class B biosolids in which pathogen numbers are significantly reduced, but are still present. Additional restrictions on the use and placement of Class B biosolids ensure a level of safety equivalent to Class A. Aerobic and anaerobic digestion, air drying and lime stabilization are types of processes used to meet the Class B pathogen density limit of less than 2,000,000 fecal coliforms/gram dry weight of total solids.

PROTOZOA

Single-celled, microorganisms many species of which can infect man and cause disease. The infective forms are passed as cysts or oocysts in the feces of man and animals and accumulate in flocculated solids; they are quite resistant to disinfection processes, such as chlorination, that eliminate most bacteria, but are susceptible to destruction by drying.

RETENTION TIME

The period of time wastewater or biosolids takes to pass through a particular part of a treatment process, calculated by dividing the volume of processing unit by the volume of material flowing per unit time.

RISK, POTENTIAL

Refers to a description of the pathways and considerations involved in the occurrence of an event (or series of events) that may result in an adverse health or environmental effect.

RISK ASSESSMENT

A quantitative measure of the probability of the occurrence of an adverse health or environmental effect. Involves a multi-step process that includes hazard identification, exposure assessment, dose-response evaluation, and risk characterization. The latter combines this information so that risk is calculated:

Risk = Hazard x Exposure

RUNOFF

That part of the precipitation that runs off the surface of a drainage area when it is not absorbed by the soil.

SALMONELLA

Rod-shaped bacteria of the genus *Salmonella*, many of which are pathogenic, causing food poisoning, typhoid, and paratyphoid fever in human beings, or causing other infectious diseases in warm-blooded animals, and can cause allergic reactions in susceptible humans, and sickness, including severe diarrhea with discharge of blood.

SEPTAGE

Domestic sewage (liquid and solids) removed from septic tanks, cesspools, portable toilets, and marine sanitation devices; not commercial or industrial wastewater.

SEWAGE, DOMESTIC

Residual liquids and solids from households conveyed in municipal wastewater sewers; distinguished from wastewater carried in dedicated industrial sewers. See Wastewater.

SLUMPING

Failure of a stockpile to retain a consolidated shape usually due to insufficient dewatering of the biosolids. Slumping may result in biosolids movement beyond the boundaries of a designated stockpile area or create handling difficulties when the materials are scooped up and loaded into spreaders.

SOLIDS

In water and wastewater treatment, any dissolved, suspended, or volatile substance contained in or removed from water or wastewater.

STABILITY

The characteristics of a material that contribute to its resistance to decomposition by microbes, and to generation of odorous metabolites. The relevant characteristics include the degree of organic matter decomposition, nutrient, moisture and salts content, pH, and temperature. For biosolids, compost, or animal manure, stability is a

general term used to describe the quality of the material taking in to account its origin, processing, and intended use.

STAGING

The concurrent delivery and application of biosolids, allowing for the transfer of biosolids from transport vehicles to land application equipment. Dewatered materials may be off-loaded from delivery vehicles to temporary stockpiles to facilitate the loading of spreading equipment.

STOCKPILING

Holding of biosolids at an active field site long enough to accumulate sufficient material to complete the field application.

STORAGE

Placement of Class A or B biosolids in designated locations (other than the WWTP) until material is land applied; referred to as field storage. See also Off-Site Storage.

STORAGE FACILITY

An area of land or constructed facilities committed to hold biosolids until the material may be land applied at on- or off-site locations; may be used to store biosolids for up to two years. However, most are managed so that biosolids
come and go on a shorter cycle based on weather conditions, crop rotations and land availability, equipment availability, or to accumulate sufficient material for efficient spreading operations.

THRESHOLD ODOR

See Odor Threshold

TURBULENCE

Irregular atmospheric motion especially characterized by up and down currents. Increasing turbulence results in dilution of odors.

VAR

Abbreviation for Vector Attraction Reduction (see Appendix C, Table C-3).

VECTOR

An agent such as an insect, bird, animal, that is capable of transporting pathogens.

VIRUS

A microscopic, non-filterable biological unit, technically not living, but capable of reproduction inside cells of other living organisms, including bacteria, protozoa, plants, and animals.

VOLATILE COMPOUND

A substance that vaporizes at ambient temperature. Above average heat can increase the volatilization (vaporization) rate and amount of many volatile substances.

WWTP

Abbreviation for wastewater treatment plant

MUNICIPAL WASTEWATER

Household and commercial water discharged into municipal sewer pipes; contains mainly human excreta and used water. Distinguished from solely industrial wastewater.

WASTEWATER TREATMENT

The processes commonly used to render water safe for discharge into a U.S. waterway: 1) Preliminary treatment includes removal of screenings, grit, grease, and floating solids; 2) Primary treatment includes removal of readily settleable organic solids; 50-60% suspended solids are typically removed along with 25-40% BOD; 3) Secondary treatment involves use of biological processes along with settling; 85-90% of BOD and suspended solids are removed during secondary treatment; 3) Tertiary treatment involves the use of additional biological, physical, or chemical processes to remove more of the remaining nutrients and suspended solids.